Does Anchoring of Inflation Expectations Promote Monetary Policy Transmission in India?

Silu Muduli
Reserve Bank of India

Abstract

This study examines the role of anchored household inflation expectations in reinforcing monetary policy transmission in India. First, it constructs an inflation expectation anchoring index using households' inflation forecasts. Second, it empirically examines the impact of monetary policy on inflation and employment for different levels of anchoring using manufacturing industry-level data. Results show that inflation expectations are anchored following the adoption of the inflation-targeting monetary policy framework in India and foster monetary policy transmission. Financially healthier industries have lower costs of external finance, and these costs are more sensitive to monetary policy when inflation expectations are well-anchored. Furthermore, relatively tangible industries benefit in periods of low inflation expectations anchoring. This advantage of lower cost of funds and well-anchored inflation expectations promotes higher investment, as a result, leads to higher economic activity and employment generation. Moreover, in episodes of higher anchoring, monetary policy is more effective in stabilising inflation.

Keywords: Inflation expectations, monetary policy, economic growth, employment.
JEL Classification: E31, E52, J21, O47.

The views expressed in the paper are those of the author(s) and not necessarily those of the institution to which they belong.
E-mail: silumuduli@rbi.org.in (Silu Muduli).

1 Introduction

Inflation expectations influence households' consumption decisions, firms' price-setting behaviour, and the pricing of financial products by market participants. This brings up the significance of inflation expectations anchoring, which has several stabilizing effects. For instance, it might foster economic growth and stabilise inflation. Monetary authorities also consider inflation expectations anchoring as an implicit indicator of monetary policy effectiveness to ensure price stability (Bems et al., 2021; Falck et al., 2021). The degree of inflation expectations anchoring also advocates for appropriate monetary policy design, actions, and communications that need to be undertaken to build the central bank's credibility to further improve its policy effectiveness (Bernanke, 2007). Since the 1990s, with the success of the inflation targeting (IT) regime, several monetary authorities joined the parade to rebuild their credibility and stabilise inflation with the forward guidance (Cunningham et al., 2010). India formally introduced the IT regime in August 2016, however, before that it informally committed to an inflation target in the second quarter of 2014. This glide path approach stabilised the inflation within the target range of 2 to 6 per cent before Covid-19, with temporary inflation prints outside the target range. In the Covid-19 phase, ample global liquidity, supply chain disruptions, and a rise in commodity prices due to the Russia-Ukraine conflict led consumer price-based inflation to a higher level. The pervasiveness of higher inflation led monetary authorities across the globe to engage in monetary policy tightening by raising policy interest rates to stabilise inflation. This stabilisation policy has a real cost that is associated with a higher sacrifice of economic growth. This sacrifice of real economic growth could be minimized if the inflation expectations are well-anchored with higher central bank credibility. Moreover, higher inflation anchoring helps in price stability which helps in investment decisions and increases future growth perspectives (Baldwin & Ruback, 1986; Fischer & Modigliani, 1978). With this benefit of inflation anchoring, monetary authorities could achieve economic stability along with the primary objective of price stability.

Empirical studies in advanced economies, such as the United States, find evidence of the strengthening of monetary policy transmission when inflation expectations are well-anchored (Diegel & Nautz, 2021; Falck et al., 2021). Choi et al. (2022) address this question using a sample of 36 advanced and emerging market economies over the years 1990 - 2014. They find manufacturing industries that are relatively financially constrained (or have a higher dependence on external finance) have a higher value addition when inflation is well-anchored. While examining the impact of monetary policy on inflation, Falck et al. (2021) find that during a higher disagreement on inflation expectations, a 100 basis points increase in policy rate increases inflation by 0.7 percentage points, and during the low disagreement phase, it softens inflation by 0.8 percentage points.

Besides inflation expectations disagreement, this study enquires whether anchoring inflation expectations reinforces monetary policy transmission. We have two core objectives while investigating the impact of monetary policy: 1) impact on growth/employment; and 2) impact on

inflation in India. First, we investigate the impact of monetary policy on the value-added and employment generation at the industry level for a different level of anchoring of inflation expectations. The second objective is to identify the instrumental role of anchoring of inflation expectations on the impact of monetary policy on inflation dynamics. Our analysis reveals that inflation expectations are anchored after the adoption of the inflation-targeting framework and foster monetary policy transmission to stabilise inflation and employment. In an expansionary monetary policy stance, lower cost of funds and well-anchored inflation expectations incentivise industries to undertake higher investment, as a result, leads to higher economic activity and employment generation. Regime switching local projection impulse response analysis function reveals that, in episodes of higher anchoring, monetary policy is more effective in stabilising inflation.

The rest of the study is structured as follows. Section 2 briefly reviews the literature on the inflation-growth nexus, monetary policy, and the inflation anchoring of inflation expectations on monetary transmission. Section 3 discussed data and constructs the inflation anchoring index. Later, it examines the monetary policy transmission for different levels of anchoring of inflation expectations. The last section of the study concludes based on the empirical investigations and discussed a few policies implied by the study.

2 Related Literature

The nexus between price stability and economic growth has been well-studied in theoretical and empirical frameworks (Apergis, 2005; Feldstein, 1999). A low and stable inflation environment helps in economic decision-making and efficient allocation of resources (Friedman, 1977). In periods of higher inflation uncertainty, economic agents fail to precisely predict the inflation which adversely affects their consumption and investment decisions (Baldwin & Ruback, 1986; Byrne & Davis, 2004). These investment decisions are guided by the availability of financial resources and the costs of borrowing them, which are quoted in nominal terms. Price stability through a credible monetary stance and futuristic growth prospects help in anticipating future interest rate paths and investment viability based on the net present value of the project. The credibility of the central bank's monetary stance and price stability help borrowers, particularly those firms that are heavily dependent on external finance, to undertake real investments by borrowing, or to postpone for the future (Choi et al., 2022). This helps in higher economic activity (Papadamou et al., 2014).

To enhance the credibility of monetary policy, many central banks adopted the IT framework to maintain price stability. The IT framework reduced inflation with a minimal sacrifice of growth (Ayres et al., 2014). The introduction of the IT framework, particularly in developing economies, reduced disagreement in inflation expectations and helped in stabilising the prices (Capistrán & Ramos-Francia, 2010). This might be due to the enhanced credibility of the central

banks and the anchoring of inflation expectations. Few studies find opposite results, for instance, based on survey results of firm managers in New Zealand, Kumar et al. (2015) find strong disagreement of inflation expectations among the respondents. This disagreement was particularly due to incomplete information on the central bank's mandate and its actions even after more than two decades of its adoption of the IT framework and its policy actions. Binder (2017) find similar evidence for the United States. The traditional audiences of central banks are financial market participants and professional forecasters in large firms. This informational opaqueness may be for small firms that absorb a very small fraction of the labour force and are localised. Their forecast on inflation may be from the limited space of commodities that they are consuming or using as input in their firms. With these mixed shreds of evidence on the role of IT in anchoring inflation expectations, central bank communication becomes crucial for anchoring inflation expectations, particularly in the post-Covid-19 phase (De Fiore et al., 2022).

During the global financial crisis (GFC, 2007 -09), monetary authorities in advanced and emerging economies adopted an easy monetary policy to boost economic growth. In the post-GFC phase, although inflation remained low in major advanced economies, economic growth did not show a significant improvement. This motivates us to reconsider the inflation-growth nexus amid the expansionary monetary stance of the central banks. By adopting an inflation-targeting framework, monetary authorities act and communicate by providing consistent, coherent, and strategic future guidance to anchor the inflation expectations (Williams, 2015). The trust monetary authority builds improves the anchoring of inflation expectations (Christelis et al., 2020). This helps in informed investment decision-making and fosters economic growth through *the investment channel*. To examine the efficacy of monetary policy transmission, it is also crucial to probe whether inflation anchoring helps monetary policy transmission and its role in economic growth.

On the other hand, monetary transmission could directly result in inflation through anchoring inflation expectations. For instance, in a New Keynesian Phillips Curve (NKPC) based inflation dynamics setup, inflation expectations are a pivotal shifting parameter. De-anchoring inflation expectations sacrifice a higher growth to achieve a desired level of inflation. With the growth-inflation trade-off, central banks may prefer lower disagreements in inflation expectations for smooth monetary transmission. Empirical evidence suggests that monetary policy gets a flavour of success when there is less degree of disagreement in inflation expectations (Falck et al., 2021). More surprisingly, when disagreement is low, an increase in monetary policy leads to higher inflation. Even when consumers were asked about the impact of tightening monetary policy, the majority in the United States replied in favour of higher inflationary pressure (Andre et al., 2022). So, this opposite channel could dominate sectors that heavily depend on external finance, or they pay a significant chunk of their earnings as interest expenses.

The credibility of central bank monetary policy conducts significantly improved following the adoption of the IT framework in India (Samanta & Kumari, 2021). However, this study was silent

on the benefits that India reaped by anchoring the inflation expectations. Further, this improved credibility led to the anchoring of household inflation expectations. This study fills this research gap and contributes to the growing literature on state-dependent monetary policy transmission in India with an emphasis on the anchoring of inflation expectations. Broadly, it highlights how anchored inflation expectations and financial health of manufacturing sectors facilitate monetary transmission channel and helps in employment generation and ensures price stability.

3 Empirical Analysis

We begin the empirical analysis by constructing the inflation expectations anchoring index (IEA index). Using the constructed IEA index we estimate the facilitating role of inflation expectations anchoring in monetary policy transmission. First, we estimate the impact of monetary policy rate on value-added and employment generation at the industry level *via* investment channel, and next, we examine the impact of monetary policy on inflation and growth by interacting them with the IEA index.

3.1 Construction of Inflation Expectations Anchoring Index

This study uses one-year ahead inflation expectations of households published in the Inflation Expectations Survey of Households (IESH) by the Reserve Bank of India to construct the IEA index. The survey is conducted in major cities of India, hence, represents views of the urban population on inflation. Of course, all of them are not price-setters and represent around one-fourth of the total population of India. Since they live in cities and are actively engaged in certain economic activities where they have pricing power for their products. For instance, they might be in managerial positions in large firms, owners of certain registered companies, owners of small unregistered vendors, *etc.* This gives them a certain extent of retail price-setting power. With this assumption, we study the anchoring of household inflation expectations and their impact on monetary policy.

In the literature, researchers measure the anchoring of inflation expectations by estimating the time-varying sensitivity of long-term inflation expectations to short-run or recently observed inflation surprises (Bernanke, 2007; Choi et al., 2022). Bems et al. (2021) measure the anchoring of inflation expectations by considering three dimensions: 1) **sensitivity**: influence of current realised inflation on inflation expectations; 2) **consistency**: deviation of inflation expectations from the target; 3) **stability**: variation in inflation expectations from its historical average. Along with the lines in the literature, we construct the IEA index using three dimensions:

1. **Sensitivity of one-year ahead inflation expectations to inflation surprises (Sensitivity):** This dimension measures the degree of sensitivity of long-term inflation expectations to realized surprises in the current inflation. When economic agents have higher credibility

on the commitment of monetary authority to stabilise the prices, they less react to short-term fluctuations. This results in the complete anchoring of inflation expectations. Formally, let $E\pi_t$ be the expected inflation for time period t and π_t is the realised inflation observed at time period t. In the time-varying coefficient regression,

$$\Delta E\pi_t = \alpha_t + \beta_t(\pi_{t-1} - E\pi_{t-1}) + \epsilon_t \tag{1}$$

sensitivity β_t indicates the responsiveness of past surprises (errors) in present inflation forecasts of households. A higher degree of sensitivity indicates lower anchoring and *vice-versa*. Based on this interpretation, the first dimension (say d_1) is given by

$$d_1(t) = \frac{1}{1 + |\beta_t|}$$

2. **Deviation of one-year ahead inflation expectations from the target (Consistency):** Monetary authorities expect higher credibility, and those who follow IT frameworks, always expect long-term inflation expectations to align along the mandated target. Since India follows the IT framework by targeting 4 per cent consumer price inflation, deviation of inflation expectations from the 4 per cent target indicates a lower degree of anchoring. Aligning to 4 per cent indicates complete anchoring and a higher deviation from the target indicates less anchoring of inflation expectations. Based on this conceptualisation, the second dimension is given by:

$$d_2(t) = \frac{1}{1 + |E\pi_t - 4|}$$

In India, the households' inflation expectations are systematically biased. The bias on average is around 5 per cent higher than the realized inflation. This systematically lowers the value of $d_2(t)$, however, the direction remains almost consistent with the realised inflation.

3. **Dispersion in responses of inflation expectations (Stability):** When there is a higher dispersion in responses on inflation expectations by respondents, this indicates a phase of higher uncertainty and low credibility on the monetary policy regime. Higher dispersion indicates lower anchoring as agents look past to forecast future prices and pay less attention to forward-guidance communication. Hence, the third dimension is given by

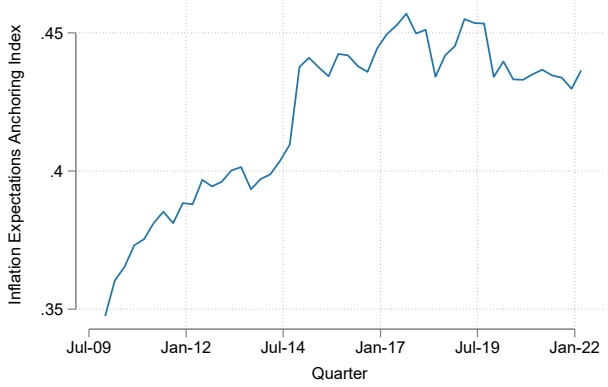
$$d_3(t) = \frac{1}{1 + \sigma_{E\pi_t}}$$

Here, $\sigma_{E\pi_t}$ is the standard deviation of inflation expectations of different respondents in the survey at time t.

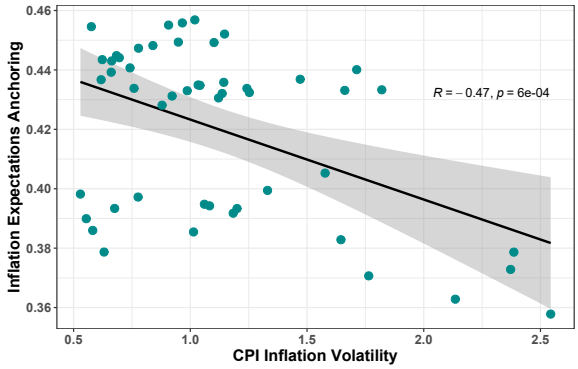
It is important to notice that, the consistency and stability feature of inflation expectations may not always imply inflation anchoring. For instance, if all agents find the realised inflation to be

Figure 1: Inflation Expectations Anchoring Index

(a) IEA Index



(b) Inflation Volatility and IEA Index



Source: Author's calculations

very stable in the past and around the target of 4 per cent, then the majority of them will align their forecast to the target. This will lead to higher consistency and stability, however, it may not be anchored. Therefore, the sensitivity dimension mitigates this pitfall and comprehensives the measure.

Aggregating all the above three dimensions, the IEA index at time t is given by:

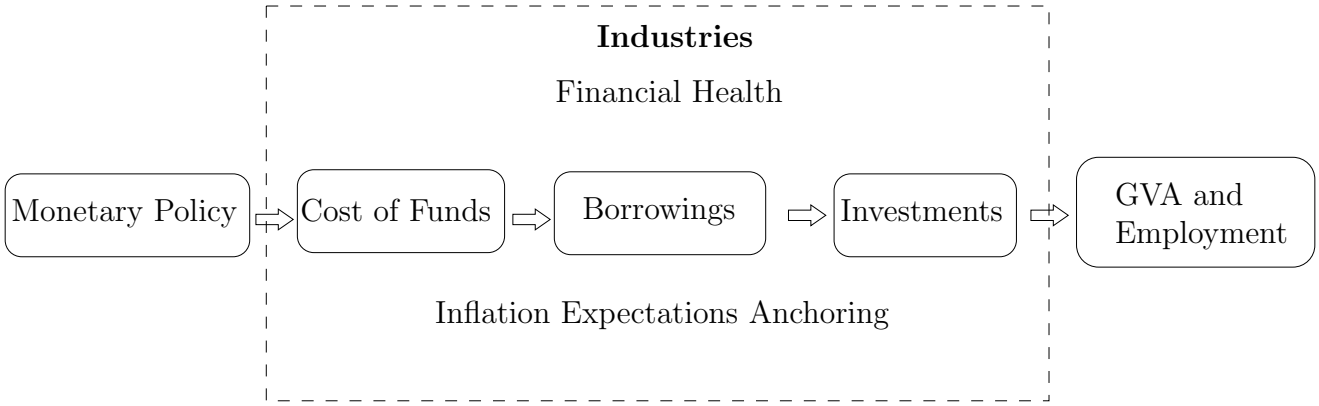
$$\text{IEA Index}(t) = \frac{d_1(t) + d_2(t) + d_3(t)}{3} \tag{2}$$

Values of the IEA index lie in the range (0,1]. A higher value of the index indicates higher anchoring of households' inflation expectations (Figure 1a). The anchoring of inflation expectations significantly improved from the second quarter of 2014 - the glide path preceding the formal adoption of inflation targeting in the third quarter of 2016. Following the adoption, the anchoring index remained stable in the pre-Covid-19 phase and marginally attenuated in the Covid-19 period. In periods of high historical observed volatility of realized inflation, inflation expectations are less anchored which is conceptually consistent with the constructed index. We use this constructed index as a measure of inflation expectations anchoring to investigate its role in monetary policy transmission and investment decisions for manufacturing industries.

3.2 Monetary Policy, GVA, and Employment

This section addresses the empirical questions that we posed in the introduction section using industry-level data of 28 industries in the post-global financial crisis period from 2009 to 2018. Data used in the analysis are sourced from the Annual Survey of Industries (ASI), which is conducted by the Central Statistics Office (CSO). The ASI data is the major source of industrial

Figure 2: Monetary Policy Transmission



statistics which disseminates information on industry-level characteristics, such as production, investment, employment and financial status - of registered manufacturing industries in India.

The main conceptual framework of empirical analysis goes as follows and is graphically presented in Figure 2. Monetary authorities influence industries' cost of external finance/funds, which in turn, affects loan demands. Based on the cost of external funds and future expected inflation, firms in the industry assess the viability of the investment to be undertaken during that period. This study examines the role of anchoring inflation expectations at this juncture by investigating whether a higher anchoring promotes investment as they trust the monetary authority's commitment to ensure price stability. Moreover, this facilitating role of inflation expectations is crucial for industries that heavily depend on external finance. Further adding to the channel, we empirically explore value-addition and employment generated through the investment which is partly influenced by the lending channel.

The dynamic panel model framework has been employed to estimate the channel along with interaction effects. Formally, let y_{it} be the dependent variable and x_{it} is the vector of explanatory variables realised for sector i in time period t. We estimate the following dynamic relationship,

$$y_{it} = \alpha + \beta y_{it-1} + \phi \text{IEA index}_t + \gamma x_{it} + \delta(\text{IEA index}_t \times x_{it}) + \psi z_{it} + \epsilon_{it} \tag{3}$$

where z_{it} is a vector of other controls. The parameter δ captures the interaction effect, *i.e.*, sensitivity of y_{it} to x_{it} for different levels of inflation expectations anchoring index. Decisions on the dependent variable and independent variables depend on the objective of different stages of the monetary transmission channel. The following sections estimate the relationships for various stages explained in the Figure 2.

3.2.1 Monetary Policy and Cost of Funds

Long-term loan contracts, in general, are written in nominal terms considering the future inflation risks. Interest rates faced by the industries face containing a component of expected inflation for longer-term loan contracts. If these expected inflation forecasts are not anchored, this could lead to a higher inflation risk premium, hence a higher cost of funds. Even though monetary policy is expansionary, if inflations are not anchored, then this could disrupt the monetary policy transmission. Hence, anchoring inflation expectations is very crucial while investigating monetary policy transmission. To establish the above argument we examine the impact of policy rate and inflation expectations anchoring index on banks' lending rates. The lending rates offered by the banks are a function of the policy rate and premium over it. That is,

$$\text{Lending Rate} = f(\text{Policy Rate, Risk Premium})$$

Since the rate is in nominal terms, the risk premium contains credit risk, liquidity risk, inflation risk, etc. The inflation risk premium depends on the future expected inflation and uncertainties around it. Hence, the lower the anchoring, the higher the premium. Using an ordinary least square regression framework, we estimate the impact of policy rate (proxied by weighted average call rate (WACR)) and inflation expectations anchoring index on banks' lending rate (proxied by weighted average lending rate (WALR) of outstanding loans). Anchoring inflation expectations lowers the spread and facilitates the interest rate channel of monetary policy (Table 2). Hence, when there is less disagreement and stability in the inflation expectations process, banks lower their spread and transmit the intended policy changes to the borrowers. Next, we examine the impact of monetary policy on the cost of funds of the industries and subsequent channels of transmission of growth and employment.

Our results in certain specifications show a rise in the monetary policy rate, proxied by the WACR, raises the cost of funds at the industry level and *vice-versa* (Table 3). This transmission magnifies when inflation expectations are well anchored. Industries that have tangible assets face a lower cost of funds. Availability of higher fixed capital helps firms to pledge for collateral and these assets have a higher fire sale value when the firm turns insolvent, hence, lowering the cost of external funds. Moreover, the tangibility becomes crucial in benefitting sectors when inflation expectations are less anchored. Similarly, industries with higher labour productivity (proxied by net value added per worker) have a lower cost of funds and the gains are higher when the inflation is well-anchored. Sectors' debt servicing ability help in lowering the cost of funds during phases of well-anchored inflation expectations. Surprisingly, highly leveraged industries, have a lower cost of funds but their cost of funds is more sensitive to WACR. Basic metals, other non-metallic minerals, and paper and paper products industries are relatively leveraged but face a lower cost of funds. These industries are relatively leveraged to absorb a significant proportion of the labour force. They might get loans with a subsidised rate of borrowing. Mining and quarrying have a

higher gross value-added, but they face a higher cost of funds, possibly due to their higher leverage. There could be several possible reasons that may work behind the scene.

3.2.2 Monetary Policy and Industry Loans

The cost of external finance is a major determinant of demands for loans by various sectors. The previous section established a strong influence of monetary policy on the cost of funds of the sectors – proxied by total interest rate expenses to total outstanding loans. The interest expenses during a year are adjusted based on the monetary policy rate, of outstanding and fresh loans. This section estimates the impact of the cost of funds on the fresh loan demand by the sector. Results show that a higher cost of funds lowers credit demand, however, the influence is relatively weaker when inflation expectations are well-anchored (Table 4). Although sensitivity is lower during the high anchored phase, overall, the loan growth rates are higher during the same. This may be due to higher price stability and viability of projects amid a less uncertain economic environment. Tangible, labour-efficient sectors with higher debt servicing ability have lower loan demands and their influence weakens when inflation expectations are less anchored.

The above empirical evidence supports the credit channel of monetary policy transmission and its strength when inflation expectations are unanchored. India's monetary authority actively reacted to the inflationary phase following the global financial crisis. During the time, wholesale price inflation was the benchmark for conducting monetary policy. However, consumer price inflation was relatively high and above 10 per cent. The monetary authority increased its policy rate to stabilise the overall price situation. Inflation expectations were less anchored during that period and the evidence suggests that the moderation in loan growth rate may be due to the tight monetary policy during the phase. Inflation expectations anchoring started improving in 2014 when the Reserve Bank of India followed a glide path before adopting flexible inflation targeting (IT) framework and the consumer price inflation remained within the comfort zone of 2 to 6 per cent of the IT framework. However, the loan growth rate was lower and below 10 per cent during the phase and was less sensitive to the cost of external finance.

3.2.3 Industry Loans and Fixed Investment

The fixed capital, in particular, is a major input in the production process along with the labour and other complementing inputs. The sample considered in the study consists of organised industries that are engaged in manufacturing processes, repair services, gas and water supply and cold storage. These industries heavily depend on fixed capital for their production process. Change in fixed capital is the additional fixed capital investment in the industry to continue its production based on the current and future demand. Firms in the industry undertake projects that have future growth prospects and yield cashflows that make them viable. This fixed investment requires financial capital to purchase machines, equipment, hardware, building plants, etc. to

replace depreciated fixed capital and add new fixed capital.

Generally, it is natural to assume that a firm making normal profits borrows to invest in new projects. However, it may not always be a strong and reasonable assumption about the firms. Loans absorbed in a sector may not always result in higher investments. Firms may use the borrowed funds for their working capital or include them in their interest expenses to defend their credit rating. This results in resource misallocation and may not generate enough employment opportunities. For instance, the presence of zombie firms which absorb a significant chunk of total credits, they borrow more often to repay their previous debts – the evergreening process. Their existence is detrimental to the economy, however, the government subsidizes these firms for their contribution to employment share or because of their national importance. Hence it is important to examine whether a higher loan growth rate leads to higher investment or it results in higher credit misallocation. This section investigates whether fresh loans absorbed in different sectors result in higher investment.

Results show that higher loan growth results in higher investments. Investments are higher in episodes with well-anchored inflation expectations and higher future business prospects (Table 5). The investment sensitivity to loan demand is higher when there are higher business expectations and remains unaltered for a different level of inflation expectations anchoring. Tangible sectors with higher debt servicing ability show a higher level of investment. In the time of a low level of inflation expectations anchoring, tangible sectors show a higher level of investment, possibly due to the benefits of lower cost of funds during the phase.

3.2.4 Gross Value Addition and Employment

The previous section empirically established that investments are driven by demand for loans – a major input for firms that have liquidity constraints in a sector. Then it becomes apparent that this will lead to a higher gross value added in the sector and lead to higher employment generation. This sector empirically examines this linkage and helps to understand whether monetary policy has an impact on economic activity and employment. Results show that higher investment leads to higher GVA. Anchoring of inflation expectations strengthens the linkage and significantly improves GVA growth.

An improvement in GVA growth generates higher employment in different sectors and the effect is relatively stronger when inflation expectations are well-anchored (Table 6). A 10 per cent increase in GVA increases employment by 3.3 per cent and it improves when inflation expectations are anchored. For instance, when inflation expectations are completely anchored, employment grows in the same proportion as the GVA. If inflation expectations are unanchored, this may bring the possibility of jobless growth. Jobless growth has been a major concern in India and many scholars have highlighted it in their sectoral studies (Abubakar & Nurudeen, 2019; Jagannathan, 2018). Price stability helps firms in the precise estimation of future profits and wages, this possibly

helps in the hiring of new employees by optimising their profits. This stable situation also reduces frequent wage revisions and smoothens consumption. Sectors that are financially sound with higher debt servicing ability generate higher employment compared to those sectors that have less ability. Tangible sectors show a higher GVA growth, but the employment generation was found to be lower.

3.3 Monetary Policy and Inflation

This section examines the direct impact of monetary policy on consumer price index-based headline inflation. The previous section established that anchoring inflation expectations foster monetary policy transmission by influencing growth and employment generation. The primary and ultimate objective of the RBI is to influence inflation using its monetary policy instruments. In phases of well-anchored inflation expectations, price-setting firms stick to the central bank's inflation target and become insensitive to new information on inflations. This helps in stabilising inflation dynamics with minimal sacrifice of growth (Huang et al., 2019). In the literature also, few studies find strong evidence of the benefits of anchored inflation expectations in monetary policy transmission (Falck et al., 2021; Nakamura & Steinsson, 2018).

To examine the impact of monetary policy on inflation for different levels of inflation expectations anchoring, we estimate the impulse responses by local projections methodology developed by Jordà (2005). Later, Auerbach & Gorodnichenko (2012) augmented the basic local projection model by introducing non-linearity with a smooth regime-switching mechanism. For vector of endogenous variables y_t with two regimes R_1 and R_2 based on w_t, the specification of local projected impulse response function for h horizon is given by:

$$y_{t+h} = \alpha_h + \Big(\sum_{i=1}^{p} \beta_i^{R_1,h} y_{t-i}\Big) F(\tilde{w}_t) + \Big(\sum_{i=1}^{p} \beta_i^{R_2,h} y_{t-i}\Big)(1 - F(\tilde{w}_t)) + u_{t+h} \tag{4}$$

where, $h = 1, 2, 3, ...,$ u_{t+h} follows a white noise proces and $F(\tilde{w}_t)$ is logistic function defined by:

$$F(\tilde{w}_t) = \frac{e^{-\gamma \tilde{w}_t}}{1 + e^{-\gamma \tilde{w}_t}} \tag{5}$$

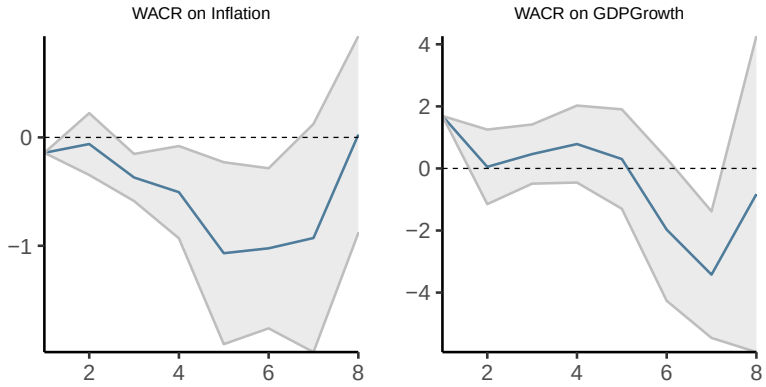
where $\tilde{w}_t$ is the cyclical component of w_t based on Hodrick & Prescott (1997) filter. In our case, y_t is a vector of consumer price headline inflation and monetary policy rate, and w_t is the IEA index value. This model shows the impulse response of inflation to monetary policy rate for different levels of anchoring of inflation expectations.

This analysis reveals that monetary policy is more effective in stabilizing inflation when inflation expectations are well-anchored (Figure 3). Moreover, when inflation expectations are anchored, monetary policy has a negative cumulative impact on growth. In the phase of low anchoring, monetary policy has a very limited role in stabilising inflation and growth. This empir-

ical evidence further supports the benefits of inflation expectations anchoring in monetary policy transmission.

Figure 3: Inflation Expectations Anchoring and Monetary Policy

(a) High Inflation Expectations Anchoring



(b) Low Inflation Expectations Anchoring

4 Conclusions

The significance of inflation expectations anchoring in economic decision-making has been highlighted in the literature for both advanced and emerging market developing economies. Moreover, anchoring inflation expectations builds central bank credibility and enhances the effectiveness of the monetary policy. This study for India spotlights the role of anchoring households' inflation expectations in monetary policy transmission. The empirical analysis reveals that the monetary policy transmission strengthens in episodes of higher inflation expectations anchoring. Industries with healthier financial positions face a lower cost of external finance and these costs are more sensitive to monetary policy rates when inflation expectations are well-anchored. Moreover, in these phases, the benefits of the low cost of funds are higher for industries with higher labour productivity and debt servicing capacity. Tangible industries have a lower cost of funds and this tangibility benefits industries in securing external finance in a period of less anchored inflation

expectations.

The cost of funds influences loans (external finance) borrowed by the industries and the influence moderates when inflation expectations are well-anchored. Tangible industries with higher labour productivity and debt servicing capacity have lower borrowing growth and show statistical insignificance for these characteristics above for different anchoring levels. These loans borrowed by firms in an industry are channeled for fixed investment, particularly when firms see favourable future business prospects. In expansionary monetary policy phases, tangible and financially healthier industries with higher labour productivity are engaged in higher fixed investments. Consequently, these higher fixed investments result in higher economic activity at the industry level, particularly, in episodes of higher inflation expectations anchoring. In these phases, it is apparent that higher economic activity generates higher employment opportunities, and lowers the possibility of being jobless. This study has a few policy implications, for instance, the empirical analysis reveals the role of anchoring inflation expectations in monetary policy transmission. Hence, the monetary authority needs to communicate strategically in its forward guidance policy to enhance the household inflation expectation and build up central bank credibility. This may help in stabilising inflation, particularly in periods of high inflation, with minimal sacrifice of growth and employment.

References

Abubakar, J., & Nurudeen, I. (2019). Economic growth in India, is it a jobless growth? An empirical examination using Okun's law. *The Indian Journal of Labour Economics*, *62*(2), 307–317.

Andre, P., Pizzinelli, C., Roth, C., & Wohlfart, J. (2022). Subjective Models of the Macroeconomy: Evidence From Experts and Representative Samples. *The Review of Economic Studies*.

Apergis, N. (2005). Inflation uncertainty and growth: Evidence from panel data. *Australian Economic Papers*, *44*(2), 186–197.

Auerbach, A. J., & Gorodnichenko, Y. (2012). Measuring the output responses to fiscal policy. *American Economic Journal: Economic Policy*, *4*(2), 1–27.

Ayres, K., Belasen, A. R., & Kutan, A. M. (2014). Does inflation targeting lower inflation and spur growth? *Journal of Policy Modeling*, *36*(2), 373–388.

Baldwin, C. Y., & Ruback, R. S. (1986). Inflation, uncertainty, and investment. *The Journal of Finance*, *41*(3), 657–668.

Bems, R., Caselli, F., Grigoli, F., & Gruss, B. (2021). Expectations' anchoring and inflation persistence. *Journal of International Economics*, *132*, 103516.

Bernanke, B. S. (2007). *Inflation Expectations and Inflation Forecasting [Electronic resource].*

Binder, C. (2017). Fed speak on main street: Central bank communication and household expectations. *Journal of Macroeconomics*, *52*, 238–251.

Byrne, J. P., & Davis, E. P. (2004). Permanent and temporary inflation uncertainty and investment in the United States. *Economics Letters*, *85*(2), 271–277.

Capistrán, C., & Ramos-Francia, M. (2010). Does inflation targeting affect the dispersion of inflation expectations? *Journal of Money, Credit and Banking*, *42*(1), 113–134.

Choi, S., Furceri, D., Loungani, P., & Shim, M. (2022). Inflation anchoring and growth: The role of credit constraints. *Journal of Economic Dynamics and Control*, *134*, 104279.

Christelis, D., Georgarakos, D., Jappelli, T., & van Rooij, M. (2020). Trust in the central bank and inflation expectations. *International Journal of Central Banking*, *16*(6), 1–37.

Cunningham, R., Desroches, B., Santor, E., & Others. (2010). Inflation expectations and the conduct of monetary policy: A review of recent evidence and experience. *Bank of Canada Review*, *2010*(Spring), 13–25.

De Fiore, F., Goel, T., Igan, D., Moessner, R., & Others. (2022). Rising household inflation expectations: what are the communication challenges for central banks? *BIS Bulletin*, *55*, 1–9.

Diegel, M., & Nautz, D. (2021). Long-term inflation expectations and the transmission of monetary policy shocks: Evidence from a SVAR analysis. *Journal of Economic Dynamics and Control*, *130*, 104192.

Falck, E., Hoffmann, M., & Hürtgen, P. (2021). Disagreement about inflation expectations and monetary policy transmission. *Journal of Monetary Economics*, *118*, 15–31.

Feldstein, M. S. (1999). *The costs and benefits of price stability*. University of Chicago Press Chicago.

Fischer, S., & Modigliani, F. (1978). Towards an understanding of the real effects and costs of inflation. *Review of World Economics*, *114*(4), 810–833.

Friedman, M. (1977). Nobel lecture: inflation and unemployment. *Journal of Political Economy*, *85*(3), 451–472.

Hodrick, R. J., & Prescott, E. C. (1997). Postwar US business cycles: an empirical investigation. *Journal of Money, Credit, and Banking*, 1–16.

Huang, H.-C., Yeh, C.-C., & Wang, X. (2019). Inflation targeting and output-inflation tradeoffs. *Journal of International Money and Finance*, *96*, 102–120.

Jagannathan, R. (2018). *The jobs crisis in India*. Pan Macmillan.

Jordà, Ò. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review*, *95*(1), 161–182.

Kumar, S., Afrouzi, H., Coibion, O., & Gorodnichenko, Y. (2015). Inflation targeting does not anchor inflation expectations: evidence from firms in New Zealand. *Brookings Papers on Economic Activity*, 187–226.

Nakamura, E., & Steinsson, J. (2018). High-frequency identification of monetary non-neutrality: the information effect. *The Quarterly Journal of Economics*, *133*(3), 1283–1330.

Papadamou, S., Sidiropoulos, M., & Spyromitros, E. (2014). Determinants of central bank credibility and macroeconomic performance: evidence from Eastern European and Latin American countries. *Eastern European Economics*, 5–31.

Samanta, G. P., & Kumari, S. (2021). *Monetary Policy Transparency and Anchoring of Inflation Expectations in India* (Tech. Rep.). RBI Working Paper No. 03/2021.

Williams, J. C. (2015). Inflation targeting and the global financial crisis: successes and challenges. *Fourteen Years of Inflation Targeting in South Africa and the Challenge of a Changing Mandate*, 95.

Table 1: Description of Variables

Variable	**Units**	**Definition**	**Source**
Cost of funds	in per cent	Interest expenses as per cent of total outstanding loans.	ASI and authors' calculations.
Labour productivity	in rupees	Net value added divided by the total number of persons engaged in the industry.	ASI and authors' calculations.
Tangibility	in ratio	Value of gross fixed capital divided by gross value of plants and machinery.	ASI and authors' calculations.
Leverage	in ratio	Outstanding loans divided by total invested capital.	ASI and authors' calculations.
Debt Service Coverage Ratio (DSCR)	in ratio	Value of output divided by total interest rate expenses.	ASI and authors' calculations.
Weighted-average call rate (WACR)	in per cent	The interest rate prevailing in the unsecured segment of the overnight call-money market.	RBI
GVA	in rupees million	Gross value added during a financial year (April to March).	ASI
FIT Dummy	number	Takes value 1 for years after 2015, else it takes value 0.	Authors' calculations
BEI	index	Business expectations index published by the Reserve Bank of India (RBI).	RBI

Table 2: Inflation Anchoring and Interest Rate Channel

	(1) $WALR_t$	(2) $WALR_t$	(3) $WALR_t$
$WALR_{t-1}$	0.888***	0.850***	0.819***
	(0.0442)	(0.0421)	(0.0398)
$WACR_{t-1}$	0.0813***	0.0959***	-0.455
	(0.0257)	(0.0244)	(0.283)
IEA $Index_t$		-1.444**	-11.59**
		(0.687)	(5.436)
$WACR_{t-1} \times$ IEA $Index_t$			1.328*
			(0.671)
Constant	0.617*	1.558***	6.156**
	(0.321)	(0.486)	(2.463)
N	41	41	41
R^2	0.996	0.997	0.997

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Monetary Policy and Cost of Funds

	(1) Cost of $funds_{it}$	(2) Cost of $funds_{it}$	(3) Cost of $funds_{it}$	(4) Cost of $funds_{it}$	(5) Cost of $funds_{it}$	(6) Cost of $funds_{it}$
Cost of $funds_{it-1}$	0.120***	0.172***	0.560***	0.179***	0.154***	0.153**
	(0.0309)	(0.00426)	(0.0788)	(0.0111)	(0.0336)	(0.0636)
$WACR_t$	1.806***	0.838***	-23.17**	0.920***	0.600***	1.628***
	(0.183)	(0.0603)	(10.94)	(0.0865)	(0.135)	(0.327)
IEA $Index_t$	0.475	4.943	-276.9**	164.6***	-856.9**	775.5***
	(12.83)	(8.205)	(123.2)	(39.31)	(338.8)	(220.1)
Labour $Productivity_{it}$	-0.00000194***	-0.000000336***	-0.000000148	0.000142***	0.000000618	-0.00000302***
	(0.000000390)	(3.67e-08)	(0.000000454)	(0.0000263)	(0.00000131)	(0.000000657)
$Tangibility_{it}$	-12.32***	-3.125***	-7.146***	-3.527***	-443.2**	-20.06***
	(1.063)	(0.544)	(1.996)	(0.792)	(197.1)	(2.446)
$DSCR_{it}$		-0.00608				10.08***
		(0.00436)				(2.376)
$WACR \times$ IEA $Index_t$			37.21**			
			(16.66)			
Labour $Productivity \times$ IEA $Index_{it}$				-0.000227***		
				(0.0000419)		
$Tangibility \times$ IEA $Index_{it}$					683.0**	
					(304.5)	
$DSCR \times$ IEA $Index_{it}$						-15.72***
						(3.740)
Constant	17.88**	7.768	188.6**	-93.09***	564.1**	-468.7***
	(8.640)	(5.006)	(79.62)	(25.26)	(219.6)	(139.0)
Observations	242	242	242	242	242	242
AR(1) test p-value	0.0263	0.0381	0.0513	0.0218	0.0200	0.0240
AR(2) test p-value	0.664	0.812	0.338	0.566	0.855	0.579
Hansen test p-value	0.258	0.692	0.364	0.207	0.455	0.142

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Cost of Funds and Industry Loans

	(1) Loans Growth$_{it}$	(2) Loans Growth$_{it}$	(3) Loans Growth$_{it}$	(4) Loans Growth$_{it}$	(5) Loans Growth$_{it}$
Loans Growth$_{it-1}$	-0.322***	-0.353***	-0.295***	-0.282***	-0.00895
	(0.00639)	(0.00482)	(0.00846)	(0.00963)	(0.0360)
Cost of funds$_{it}$	-2.968***	-78.65***	-1.756***	-1.951***	-3.464***
	(0.0530)	(20.57)	(0.131)	(0.269)	(0.386)
IEA Index$_t$	604.7***	-1549.6***	1075.6***	-1676.1	12132.4***
	(61.98)	(487.9)	(249.5)	(1853.1)	(1734.7)
Labour Productivity$_{it}$	-0.0000189***	-0.0000466***	0.000204	-0.0000120***	-0.0000717***
	(0.00000200)	(0.00000394)	(0.000164)	(0.00000280)	(0.0000132)
Tangibility$_{it}$	-46.82***	-46.52***	9.058	-1236.1	-78.70**
	(9.201)	(7.065)	(7.484)	(1046.1)	(32.09)
DSCR$_{it}$	-1.547***	-1.105***	-1.964***	-2.028***	119.7***
	(0.0290)	(0.134)	(0.0707)	(0.0987)	(20.47)
Cost of funds × IEA Index$_{it}$		118.9***			
		(32.71)			
Labour Productivity × IEA Index$_{it}$			-0.000347		
			(0.000262)		
Tangibility × IEA Index$_{it}$				1934.9	
				(1618.5)	
DSCR × IEA Index$_{it}$					-190.2***
					(32.83)
Constant	-148.6***	1223.6***	-519.1***	1252.5	-7399.0***
	(47.71)	(307.6)	(153.0)	(1203.8)	(1069.8)
Observations	242	242	242	242	242
AR(1) test p-value	0.0241	0.0190	0.0177	0.0187	0.0191
AR(2) test p-value	0.231	0.133	0.341	0.400	0.588
Hansen test p-value	0.863	0.282	0.113	0.129	0.339

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Industry Loans and Fixed Investment

	(1)	(2)	(3)	(4)	(5)	(6)
	Investment_{it}	Investment_{it}	Investment_{it}	Investment_{it}	Investment_{it}	Investment_{it}
Investment_{it-1}	0.0355**	0.0840***	0.0963***	0.0106	0.0405***	0.167***
	(0.0139)	(0.0106)	(0.0130)	(0.00848)	(0.00691)	(0.0280)
IEA Index_t	0.588***	0.788***	0.655**	0.733	2.585***	0.832
	(0.107)	(0.152)	(0.312)	(0.468)	(0.763)	(0.545)
Loans Growth_{it}	0.0000760***	-0.00538***	-0.00157	0.000110*	0.0000878***	0.000101***
	(0.0000155)	(0.00111)	(0.00546)	(0.0000583)	(0.0000336)	(0.0000192)
BEI_t	0.00341***	0.000464	0.00160**	0.00337***	0.00154***	0.00259***
	(0.000400)	(0.000809)	(0.000689)	(0.000551)	(0.000580)	(0.000953)
$\text{Labour Productivity}_{it}$	-4.74e-09	-1.99e-08***	-2.44e-08***	-6.89e-08	-1.55e-08***	-3.41e-09
	(3.53e-09)	(3.92e-09)	(3.94e-09)	(0.000000433)	(1.73e-09)	(2.43e-09)
Tangibility_{it}	0.0724***	0.0292***	0.0253	0.00933	0.871***	0.0261***
	(0.00281)	(0.0107)	(0.0160)	(0.00884)	(0.327)	(0.00666)
DSCR_{it}	0.000217***	0.000690***	0.000801***	0.000446***	0.000704***	-0.00112
	(0.0000827)	(0.000152)	(0.000192)	(0.000162)	(0.000104)	(0.00577)
$\text{Loans Growth} \times \text{BEI}_{it}$		0.0000462***				
		(0.00000945)				
$\text{Loans Growth} \times \text{IEA Index}_{it}$			0.00242			
			(0.00845)			
$\text{Labour Productivity} \times \text{IEA Index}_{it}$				9.87e-08		
				(0.000000688)		
$\text{Tangibility} \times \text{IEA Index}_{it}$					-1.364***	
					(0.518)	
$\text{DSCR} \times \text{IEA Index}_{it}$						0.00240
						(0.00909)
Constant	-0.741***	-0.490***	-0.536***	-0.759***	-1.725***	-0.777**
	(0.0499)	(0.0719)	(0.146)	(0.271)	(0.453)	(0.313)
Observations	242	242	242	242	242	242
AR(1) test p-value	0.0601	0.0622	0.0639	0.0802	0.0809	0.0780
AR(2) test p-value	0.634	0.901	0.745	0.200	0.277	0.722
Hansen test p-value	0.926	0.461	0.433	0.727	0.605	0.845

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Fixed Investment, Growth and Employment

	(1) GVA Growth$_{it}$	(2) GVA Growth$_{it}$	(3) Employment Growth$_{it}$	(4) Employment Growth$_{it}$
GVA Growth$_{it-1}$	-0.251***	-0.476***		
	(0.0412)	(0.0221)		
Employment Growth$_{it-1}$			-0.297***	-0.330***
			(0.00912)	(0.00585)
GVA Growth $_{it}$			0.334***	-0.713*
			(0.00513)	(0.384)
Investment$_{it-1}$	53.07**	-3173.6**		
	(24.55)	(1427.2)		
IEA Index$_{it}$	206.2***	-325.0	-14.40	87.00***
	(32.95)	(343.3)	(15.54)	(13.94)
Labour Productivity$_{it}$	0.00000128*	-0.000000175	-0.000000111	0.000000355***
	(0.000000723)	(0.000000794)	(0.000000292)	(9.22e-08)
Tangibility$_{it}$	23.84**	20.72*	-2.684***	-5.575***
	(9.530)	(11.16)	(0.567)	(0.585)
DSCR$_{it}$	0.0566	-0.0124	0.172***	0.0288***
	(0.0591)	(0.0612)	(0.0187)	(0.00509)
Investment$_{it-1}$ × IEA Index		4747.2**		
		(2224.1)		
GVA Growth × IEA Index				1.642***
				(0.614)
Constant	-164.4***	211.1	7.069	-46.67***
	(15.64)	(211.3)	(9.398)	(8.674)
Observations	242	242	242	242
AR(1) test p-value	0.0781	0.0264	0.0199	0.0198
AR(2) test p-value	0.117	0.113	0.553	0.717
Hansen test p-value	0.325	0.272	0.243	0.371

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$